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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/614,807	07/09/2003	Vladimir M. Segal	H0004116-US	8639

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EXAMINER	
WILKINS III, HARRY D	
ART UNIT	**PAPER NUMBER**
1742	

DATE MAILED: 09/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/614,807	SEGAL ET AL.	
	Examiner	Art Unit	
	Harry D. Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 August 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16,19-39 and 110* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16,19-39 and 110* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 25 August 2006 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 16 and 19-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pavate et al (US 6,391,163) in view of Perry et al (US 6,896,748).

Pavate et al teach (see abstract and col. 3, lines 21-29) a copper alloy sputter target including 100 ppm-10 wt% of an alloying element such as Mg, Zn, Al, Fe, Ni or Si with a hardness of 100-250 HV (Vickers). Such a Vickers hardness equates to more than 40 on the Brinell hardness scale (HB).

However, Pavate et al do not teach the grain size of the copper sputtering target. Pavate et al does include a teaching regarding the grain size (see col. 2, lines 55-59, col. 3, lines 2-4 and col. 3, line 66 to col. 4, line 3), such that the grain size should be kept as small as possible to achieve better sputtering characteristics.

Perry et al teach (see abstract and col. 3, lines 42-46) a method of forming copper alloy sputtering targets that achieves grain sizes as small as 0.1 μm.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the process of Perry et al to make the sputtering targets of Pavate et al so that the sputtering targets of Pavate et al would have had as small a grain size as possible as suggested by Pavate et al.

Regarding claims 18-21, Perry et al teach (see col. 4, lines 8-18) that the process achieved a uniform microstructure throughout the target. Thus, one of ordinary skill in the art would have expected the resultant sputtering target to have had a uniform grain size (less than 10% standard deviation) and hardness (less than 3.5% standard deviation).

Regarding claim 22, Perry et al suggest (see col. 4, lines 43-60) that when the sputtering target had sufficient strength, it could be used as a monoblock with a backing plate.

Regarding claim 23, Pavate et al suggest using a backing plate. It would have been within the expected skill of a routineer in the art to have selected an appropriate backing plate attachment method, such as diffusion bonding with a bond yield strength of greater than about 15 ksi.

Regarding, claims 24-26, Pavate et al teach (see col. 2, lines 55-64) that the crystallographic orientation of the sputtering target was known to be a result effective variable. Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the orientation of the sputtering target in order to achieve proper sputtering results.

Regarding claim 27, Pavate et al suggest Al, Zn or Mg.

Regarding claim 28, Pavate et al teach a preferred range of alloy additive of 0.01 wt% to 5 wt%.

5. Claims 29, 30 and 32-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US 6,896,748).

Perry et al teach (see abstract, col. 2, lines 6-27 and col. 3, lines 25-46) a copper alloy sputtering target including less than 10 wt% alloying elements with an average grain size of from 0.1-7.5 μm. Perry et al teach (see col. 4, lines 8-17) that the sputtering target has a uniform microstructure. Therefore, one of ordinary skill in the art would have found it obvious to have made the sputtering target with a grain size uniformity with a standard deviation of less than about 15% throughout the target.

It would have been obvious to one of ordinary skill in the art to have selected the alloying element from the list disclosed in claim 29.

Regarding claim 30, since the sputtering target of Perry et al had a uniform microstructure, one of ordinary skill in the art would have found it obvious to have made the sputtering target with a grain size uniformity with a standard deviation of less than about 10% throughout the target.

Regarding claim 32, since the sputtering target of Perry et al had a uniform microstructure, one of ordinary skill in the art would have found it obvious to have made the sputtering target with a hardness uniformity with a standard deviation of less than about 5% throughout the target.

Regarding claim 33, Perry et al suggest (see col. 4, lines 43-6) making the sputtering target as a monoblock.

Regarding claim 34, Perry et al admit that backing plates had been used. It would have been obvious to one of ordinary skill in the art to have used a backing plate with the sputtering target of Perry et al if more strength were desired in the sputtering target. It would have been within the expected skill of a routineer in the art to have selected an appropriate backing plate attachment method, such as diffusion bonding with a bond yield strength of greater than about 15 ksi.

Regarding claims 35-37, crystallographic orientation was known to be a result effective variable in the prior art (see Pavate et al (col. 2, lines 55-64)). Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the orientation of the sputtering target in order to achieve proper sputtering results.

6. Claims 31, 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US 6,896,748) in view of Pavate et al (US 6,391,163).

The teachings of Perry et al are described above.

Perry et al are silent with respect to the identity of the alloying element and the hardness of the resulting alloy.

Pavate et al teach (see abstract and col. 3, lines 21-29) a copper alloy sputter target including 100 ppm-10 wt% of an alloying element such as Mg, Zn, Al, Fe, Ni or Si with a hardness of 100-250 HV (Vickers). Such a Vickers hardness equates to more than 40 on the Brinell hardness scale (HB).

Therefore, it would have been obvious to one of ordinary skill in the art to have used Mg, Zn or Al as the alloying element in order to achieve the increased hardness of the sputtering target so that the resulting sputtering properties could be improved.

Regarding claim 39, Pavate et al teach a preferred range of alloy additive of 0.01 wt% to 5 wt%.

7. Claim 110 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US 6,896,748) in view of Nagano et al (US 2001/0035238) and Pavate et al (US 6,391,163).

The teachings of Perry et al are described above.

Perry et al are silent with respect to the identity of the alloying element and the hardness of the resulting alloy.

Nagano et al teach (see abstract and paragraphs 5-8 and 21-28) a copper sputtering target including 0.001-1.0 at% additions of various alloying elements to improve the thermal stability and to refine the grain structure. Nagano et al disclose (in paragraph 27) a laundry list of suitable alloying elements that improved the

electromigration resistance and/or thermal stability which included Cd, Ca, Au, Ag, Be, In, B, Ga, Mn, Sn, W, Cr, Co, Te, Ti, Zr, Sc, Pt, Nb, Re, Mo and Hf.

Therefore, it would have been obvious to one of ordinary skill in the art to have used one of the disclosed elements as the alloying element as suggested by Nagano et al in order to achieve a sputtering target with better electromigration resistance and/or thermal stability.

Neither Nagano et al nor Perry et al include teaching about the hardness of the resulting sputtering target.

Pavate et al teach (see abstract and col. 3, lines 21-29) a copper alloy sputter target including 100 ppm-10 wt% of an alloying element such as Mg, Zn, Al, Fe, Ni or Si with a hardness of 100-250 HV (Vickers). Such a Vickers hardness equates to more than 40 on the Brinell hardness scale (HB).

Therefore, it would have been obvious to one of ordinary skill in the art either (1) that the alloying additions of Nagano et al would have produced the increased hardness similarly to Pavate et al (since Nagano et al also suggest using Zn, Fe or Ni as the alloying element) or (2) to have used Mg, Zn or Al as an additional alloying element in order to achieve the increased hardness of the sputtering target so that the resulting sputtering properties could be improved.

Response to Arguments

8. Applicant's arguments filed 25 August 2006 have been fully considered but they are not persuasive. Applicant has argued that the combination of Pavate et al and Perry

et al do not teach the claimed grain size or the claimed standard deviation of grain and/or hardness uniformity.

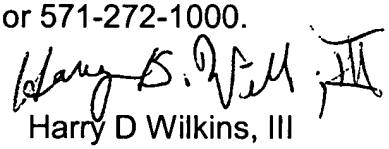
In response, the recrystallization annealing of Perry et al occurs at the end of the processing treatment. Thus, Perry et al does not teach *intermediate* recrystallization annealing. Additionally, Perry et al teach (see col. 4, lines 34-42) that if the recrystallization temperature is too high, there is an undesired growth of grains. Thus, the annealing temperature is kept to a minimum to prevent undesired grain growth. Further, Applicant's specification states that the intermediate annealing is optional (paragraph 59 of the specification as filed). Thus, by Applicant's own admission, the intermediate sub-crystallization annealing was not critical to achieving the claimed grain size.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Harry D Wilkins, III
Primary Examiner
Art Unit 1742

hdw